

Sensing Aware Autonomous Communications System, Phase I

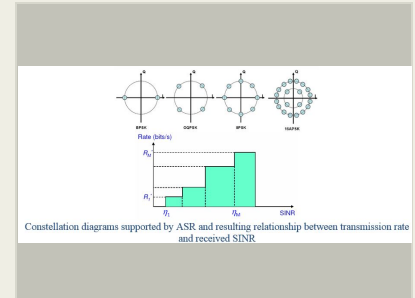
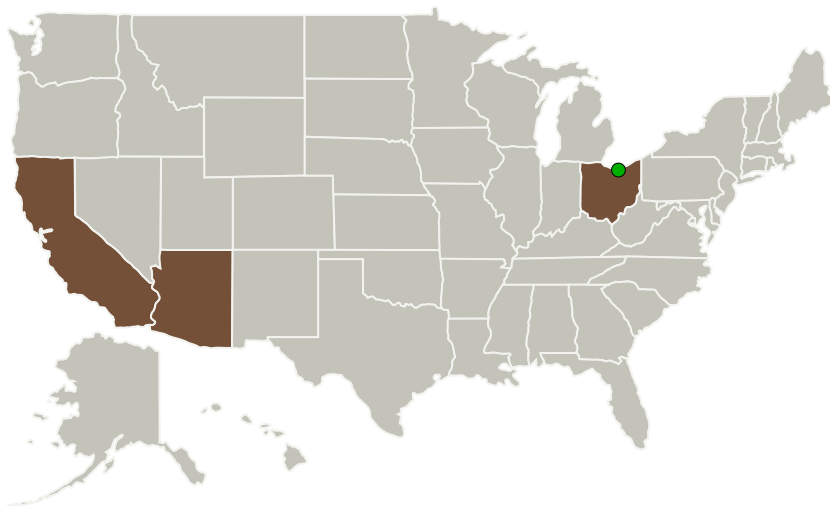
Completed Technology Project (2015 - 2016)



Project Introduction

Space Micro and its partner research institution, the University of Arizona bring together innovations in channelization and network protocol development. Together, these innovations will provide improved hopping radios (with digital, rapidly reconfigurable implementation, wider bandwidth and reduced overhead penalty for hopping) and improved spectrum and link quality sensing. We will demonstrate how these improvements provide the basis for links and networks that rapidly adapt. During phase 1, we will prove the feasibility of our approach and quantify the potential improvements in throughput and robustness of the link. We anticipate that adaptively changing the center frequency, hopping pattern, modulation and data rate will lead to doubling of the energy efficiency of data downlink for nominal conditions by keeping the link margin relatively constant. We anticipate much larger improvements for conditions with severe interference due to increased communications opportunities. Space Micro has already developed unique and critically important technologies that solve many of these challenges. Space Micro's advanced software defined radio, which we call the Agile Space Radio (ASR) is capable of adjusting its transmitter's data rate, modulation type and center frequency on the fly. Moreover, it is capable of advanced spectrum sensing to support its situational awareness over the entire accessible bandwidth, currently configured to the entire STDN band. This software-defined platform is used as a multi-band, multi-waveform transponder. We propose to demonstrate the concepts described in this proposal using the ASR. We propose to market the end product as an ASR feature set, though it may be possible to also use the concepts/end products on other SDRs.

Primary U.S. Work Locations and Key Partners



Sensing aware autonomous communications system, Phase I

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Organizations Performing Work	Role	Type	Location
Space Micro, Inc.	Lead Organization	Industry	San Diego, California
● Glenn Research Center(GRC)	Supporting Organization	NASA Center	Cleveland, Ohio
University of Arizona	Supporting Organization	Academia	Tucson, Arizona

Primary U.S. Work Locations

Arizona	California
Ohio	

Project Transitions

▶ **June 2015:** Project Start

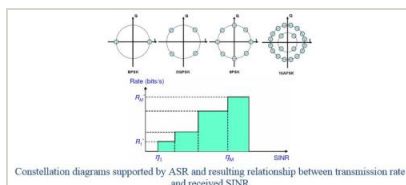
✓ **June 2016:** Closed out

Closeout Summary: Sensing aware autonomous communications system, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image(<https://techport.nasa.gov/file/139441>)

Images

**Briefing Chart Image**

Sensing aware autonomous communications system, Phase I
(<https://techport.nasa.gov/image/127592>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Space Micro, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

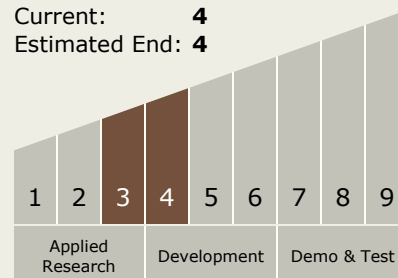
Carlos Torrez

Principal Investigator:

Elettra C Venosa

Technology Maturity (TRL)

Start: **3**
Current: **4**
Estimated End: **4**



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Technology Areas

Primary:

- TX05 Communications, Navigation, and Orbital Debris Tracking and Characterization Systems
 - └ TX05.2 Radio Frequency
 - └ TX05.2.1 Spectrum-Efficiency

Target Destinations

The Moon, Mars, Outside the Solar System, The Sun, Earth, Others Inside the Solar System